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AQUEOUS FABRIC SOFTENER COMPOSITION

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[Abstract]

The viscosity of aqueous fabric softener compositions that contain 1-10 wt% of a dispersed cationic softener of the quaternary ammonium compound type and at least two fatty residues can be increased by addition of 0.1-2 wt% C₁₂-C₂₂ alkyl or alkenyl sulfate salts or ester sulfate salts [sic; ether sulfate salts]. An aliphatic, water-soluble diol, polyol, or polyalkylene glycol is preferably additionally added.

The invention pertains to a process for increasing the viscosity of relatively low-concentration, aqueous fabric softener dispersions based on cationic softeners of the

quaternary ammonium compound type with at least two long-[chained] alkyl, alkenyl, or acyl ether groups by addition of relatively small amounts of alkyl or alkenyl sulfate salts or alkyl or alkenyl ether sulfate salts with 12-22 C atoms in the alkyl or alkenyl group.

The fabric softeners that are usual in the final rinse of textiles, of the quaternary ammonium compound type with at least two long-chained alkyl or acyl groups, are not very soluble in water and therefore are present as a dispersion in water, even in the low concentration range of less than, for example, 10 wt%. These dispersions have the property that, although they are very highly viscous and do not flow very easily at higher concentrations in water of more than 15 wt%, in the lower concentration range below 10 wt%, that is, in the concentration range that is usual for household laundry softeners, these dispersions are very thin [liquids]. This is a disadvantage for the storage stability of the dispersions and also makes handing and dosing of such products difficult. Although thickening by addition of known water-soluble polymers would be possible, such polymers have disadvantages in their effect on the softening of the textile fabric and also with respect to their biodegradability.

It was therefore the goal of the invention to thicken aqueous fabric softener preparations based on quaternary ammonium compounds by means of suitable biodegradable additives.

From DE 24 32 296 B2, it was known that alkyl ether sulfates decrease the viscosity of aqueous preparations of fatty acid alkanolamine condensates.

It was found, surprisingly, that additions of alkyl sulfate salts and alkyl ether sulfate salts to dispersions of fabric softeners of the quaternary ammonium compound type increases their viscosity.

The objects of the invention are, therefore, aqueous fabric softener compositions that contain

(A) 1-10 wt% of a dispersed cationic softener of the quaternary ammonium compound type with at least two alkyl, alkenyl, acyloxyalkyl, or acylaminoalkyl [sic; possibly, acylamidoalkyl] groups with 12-22 C atoms in the alkyl, alkenyl, or acyl group, and, to increase the viscosity,

(B) 0.1-2 wt% of an alkyl or alkenyl sulfate salt or an alkyl or alkenyl ether sulfate salt with 12-22 C atoms in the alkyl or alkenyl group.

The fabric softener compositions of the invention have a clearly increased viscosity without negatively affecting the flow capacity of the preparations over the range of the invention. The laundry softener dispersions of the invention also show good stability to shear. Although slight viscosity increases still occur as a result of shear, such as occurs, for example, over longer periods of pumping the dispersions, or as a result of storage of the dispersions, the soft rinse dispersions of the invention show good overall storage stability and good application behavior.

As dispersed cationic softeners of the quaternary ammonium compound type (QAC), all QAC that are known for this [purpose], with at least two long-chained alkyl, alkenyl, or acyl groups, are suitable. Examples of such compounds are, for example, distearyl dimethylammonium chloride or 1-methyl-(1-stearoylamoно)-ethyl-2-heptadecyl-imidazolinium methosulfate.

Especially preferred are fabric softeners of the invention that contain a compound of Formula I as QAC:



in which, on average, 2 to 3 of the R^1 to R^4 groups contain an acyloxyalkyl group of formula $\text{R}^5\text{CO}(\text{OC}_n\text{H}_{2n})_x$ in which R^5CO can be an acyl group with 12-22 C atoms, $n = 2$ or 3 , and $x = 1$ to 10 and, in addition, an alkyl group with 1-4 C atoms and/or a hydroxy(alkoxy)alkyl group of formula $\text{H}-(\text{OC}_n\text{H}_{2n})_x$ in which $n = 2$ or 3 and $x = 1$ to 10 ; and $\text{A}^{(-)}$ is a chloride or a $\text{CH}_3\text{OSO}_3^{(-)}$ anion. Preferred in this are compounds of Formula I in which $x = 1$ and $n = 2$ and which are derived from triethanolamine. Such QAC can be prepared, for example, by reaction of triethanolamine with fatty acid esters and subsequent quaternizing of the reaction product with methyl chloride or dimethyl sulfate. As acyl group in this, acyl groups derived from those of natural or synthetic fatty acids with 12-22 C atoms or technical [grade] mixtures of plant or animal fatty acids, for example, of palm oil fatty acid or tallow fatty acids, can be included. Transesterification of triethanolamine with fatty acid esters leads to mixtures of mono-, di-, and triesters of triethanolamine, which only correspond, on average, to the reaction ratios with respect to the content of acyloxyethyl groups, even if [the reaction] is done in a mole ratio of 1:2 to 1:3.

As Component (B), the sulfuric acid monoester salt of fatty alcohols with 12-22 C atoms or of ethylene oxide adducts of 1-6 mol ethylene oxide to such fatty alcohols are suitable. As fatty alcohols, synthetic, including slightly methyl-branched, saturated primary alcohols such as those that can be obtained by, for example, hydroformylation of alpha-olefins or from ethylene by Ziegler synthesis. Preferred however, are the sulfate salts and ether sulfate salts of saturated and unsaturated natural fatty alcohols, as they can be obtained by hydrogenation processes from the corresponding fatty acid esters, for example, technical [grade] fatty alcohol cuts as they can be prepared from coco or tallow fatty acid esters. The alkyl sulfates and alkyl ether sulfates should be present as water-soluble salts, preferably as alkali [metal], magnesium, or ammonium salts.

It has been shown that thickening of the fabric softener composition of the invention can be further increased if an additional

(C) 0.1-1 wt%, based on the [amount of] total dispersion, of an aliphatic diol or polyol with 2-6 C atoms and 2-6 hydroxyl groups or a water-soluble polyalkylene glycol

is added. This addition of diol, polyol, or polyglycol substantially improves the stability to shear of the viscosity so that even in technical handling of the products, for example, during stirring, pumping, and transport, no serious variations in the viscosity occur.

Suitable diols are, for example, ethylene glycol, 1,2-propylene glycol, 1,3-propylene glycol, 1,3-butanediol; suitable polyols are, for example, glycerin, erythritol, pentaerythritol, trimethylolpropane, and sorbitol; [and] suitable polyalkylene glycols [are], for example, polyethylene glycols with molecular weights of up to 10,000, especially 200 to 1000.

A preferred embodiment of the fabric softener composition of the invention contains

- (A) 3-6 wt% of the cationic softener
- (B) 0.1-1 wt% of an alkali, magnesium, or ammonium salt of an alkyl or alkenyl sulfate, and
- (C) 0.1-1 wt% of a diol or polyol from the group of glycerin, propylene glycol, and polyethylene glycol or mixtures thereof.

Besides the characterizing components (A), (B), and possibly (C), the fabric softener compositions of the invention can also contain additives that are usual in such products. As such, primarily fragrances can be cited since, besides the soft rinsing effect, it is usually desired to impart an odor to the textile goods as well. Suitable perfume oils can be added, for example, in amounts of 0.1 to 1 wt%. For homogeneous incorporation of fragrances, it can also be desirable to add aids, for example, of lower alcohols or nonionic emulsifiers or solubilizers whose amounts, however, should not comprise more than 5 wt% of the composition. Finally, laundry soft rinses for household use are usually colored for which purpose water-soluble dyes are added in small amounts, which however, should not attach to the textile goods.

Preparation of the fabric softener compositions of the invention is preferably done in such a manner that a homogeneous melt (pre-mix solution) is prepared from Components (A), (B) and possibly (C), and then this is dispersed in water or in an aqueous solution of the remaining components.

The following examples are intended to describe the objects of the invention without restriction.

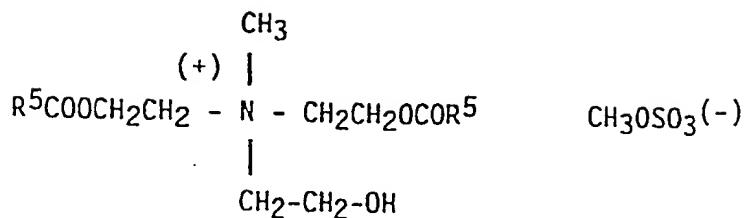
Fabric softener dispersions of the following composition were prepared (Table) and the viscosities were determined with the aid of a Brookfield rotation viscosimeter:

	1	2	3	4	5	6	7
① kationischer Weichmacher (1)	4,5	4,5	4,5	4,5	4,5	4,5	4,5
② Talfettalkohol (C ₁₆₋₁₈) Sulfat, Na-Salz (B1)	-	0,5	-	0,5	-	0,5	-
③ Kokos-Talg (1:1)-fettalkohol (C ₁₂₋₁₈) -sulfat, Na-Salz (B2)	-	-	0,5	-	0,5	-	0,5
④ Polyethylen glycol (MG:400)	-	-	-	0,5	0,5	-	-
⑤ Glycerin	-	-	-	-	-	0,5	0,5
⑥ Parfümöl	0,3	0,3	0,3	0,3	0,3	0,3	0,3
⑦ Wasser	95,2	94,7	94,7	94,2	94,3	94,2	94,2
⑧ Viskosität (m Pa·s)	20	190	90	360	200	860	840
⑨ 20 °C, 2 UpM							
⑩ Brookfield-Viskosimeter							

Key:

- 1 Cationic softener (1)
- 2 Tallow fatty alcohol (C₁₆₋₁₈) sulfate, Na salt (B1)
- 3 Coco-tallow (1:1) fatty alcohol (C₁₂₋₁₈) sulfate, Na salt (B2)
- 4 Polyethylene glycol (MW 400)
- 5 Glycerin
- 6 Perfume oil
- 7 Water
- 8 Viscosity (mPa·s)
- 9 20°C, 2 rpm
- 10 Brookfield viscosimeter

As cationic softener (A), a compound of formula



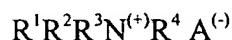
was used in which R^5CO was an oleoyl residue derived from tallow fatty acid and which is commercially available as an approx. 90% isopropanol-containing paste under the designation Stepanex VS90 (STEPAN).

As tallow fatty alcohol sulfate (B1), the commercial product Sulfopon T55 (Henkel KGaA), an approx. 50% aqueous paste, was used. As coco-tallow (1:1) fatty alcohol sulfate (B2), the commercial product Sulfopon KT115 (Henkel KGaA), an approx. 40% aqueous paste, was used.

The percentage indications in the table pertain to the content of active substance.

Claims

1. Aqueous fabric softener compositions containing
 - (A) 1-10 wt% of a dispersed cationic softener of the quaternary ammonium compound type with at least two alkyl, alkenyl, acyloxyalkyl, or acylamidoalkyl groups with 12-22 C atoms in the alkyl, alkenyl, or acyl group, characterized by the fact that to increase the viscosity,
 - (B) 0.1-2 wt% of an alkyl or alkenyl sulfate salt or an alkyl or alkenyl ether sulfate salt with 12-22 C atoms in the alkyl or alkenyl group are contained therein.
2. Aqueous fabric softener compositions as per Claim 1, characterized by the fact that
 - (C) 0.1-1 wt% of an aliphatic diol or polyol with 2-6 C atoms and 2-6 hydroxyl groups or a water-soluble polyalkylene glycol is additionally contained [therein].
3. Aqueous fabric softener compositions as per Claim 1 or 2, characterized by the fact that the quaternary ammonium compounds correspond to Formula I



in which on average 2 to 3 of the R¹ to R⁴ groups correspond to formula R⁵CO(OC_nH_{2n})_x- in which R⁵CO can be an acyl group with 12-22 C atoms, n = 2 or 3, and x = 1 to 10 and, in addition, an alkyl group with 1-4 C atoms and/or a hydroxy(alkoxy)alkyl group of formula H-(OC_nH_{2n})_x- in which n = 2 or 3 and x = 1 to 10; and A⁽⁻⁾ is a chloride or a CH₃OSO₃⁽⁻⁾- anion.

4. Aqueous fabric softener compositions as per Claims 1-3, characterized by the fact that it contains

- (A) 3-6 wt% of the cationic softener
- (B) 0.1-1 wt% of an alkali, magnesium, or ammonium salt of an alkyl or alkenyl sulfate, and
- (C) 0.1-1 wt% of a diol or polyol from the group of glycerin, propylene glycol, and polyethylene glycol or mixtures thereof.

5. Process for increasing the viscosity of an aqueous fabric softener composition that contains, in dispersed form (A), 1-10 wt% of a quaternary ammonium compound with at least two alkyl, alkenyl, acyloxyalkyl, or acylamidoalkyl groups with 12-22 C atoms in the alkyl, alkenyl, or acyl group, characterized by the fact that (B) 0.1-2.0 wt% of an alkyl or alkenyl sulfate salt with 12-22 C atoms in the alkyl or alkenyl group and possibly (C) a diol or polyol with 2-6 C atoms and 2-6 hydroxyl groups or a water-soluble polyalkylene glycol in an amount of 0.1-1 wt%, based on the entire composition, are converted along with Component (A) into a homogeneous melt, and this is dispersed in water under the effects of shear.